

Remarks

Upon entry of the following remarks, claims 1-55 are pending in the application, with claims 1, 6, 11, 18, and 22 being the independent claims. Claims 11-22 have been withdrawn. New claims 23-55 are sought to be added.

Claims 1, 6, 11, 13, 18, and 22 are sought to be amended to correct grammatical errors and to replace the term "said" with "the."

Support for the amendment to claim 1 is found throughout the application as filed, for example, at pp. 14-15, bridging paragraph.

Support for new claim 23 is found throughout the application as filed, for example, at pg. 14, lines 29-31.

Support for new claim 24 is found throughout the application as filed, for example, at pg. 7, lines 26-27.

Support for new claims 25-28 and 40-44 is found throughout the application as filed, for example, in Table A.

Support for new claims 29-31 and 45-47 is found throughout the application as filed, for example, at pg. 23, lines 7-16.

Support for new claims 32-37 and 48-53 is found throughout the application as filed, for example, at pg. 25, lines 1-8.

Support for new claims 38-39 and 54-55 is found throughout the application as filed, for example, at pg. 26, in Table B.

These changes are believed to introduce no new matter, and their entry is respectfully requested.

Based on the following remarks, Applicants respectfully request that the Examiner reconsider all objections and rejections and that they be withdrawn.

I. Provisional Statutory Double Patenting Rejections

Claims 1-22 were provisionally rejected under 35 U.S.C. § 101 based on "same invention" type double patenting over claims 1-22 of U.S. Appl. Nos. 11/842,887, 11/842,888, and 11/842,898. U.S. Appl. Nos. 11/842,887 and 11/842,888 are no longer pending, rendering moot the double patenting rejection as to those applications. Claims 1-22 of U.S. Appl. No. 11/842,898 are currently pending.

Applicants believe that the arguments presented herein will place the present application in condition for allowance. Thus, Applicants request the Examiner to hold any provisional rejection over U.S. Appl. No. 11/842,898 in abeyance until the arguments herewith have been considered, and to withdraw the rejection in the present application upon allowance of the present claims in accordance with M.P.E.P. § 804. *Id.* at pg. 800-18, 8th Ed., Rev. 5, Aug. 2006.

II. Objections to Claims 1 and 6

Claims 1 and 6 were objected to based on grammatical errors. Claims 1 and 6 have been amended to correct the grammatical errors. As such, the Examiner is respectfully requested to withdraw the objections to claims 1 and 6.

III. Rejection Under 35 U.S.C. § 102(b)

Claims 1, 3, 5, 6, 8, and 10 were rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by Hallmann *et al.*, *Proc. Natl. Acad. Sci.* 93: 669-673 (1996) ("Hallmann *et al.*"). Claims 3 and 5 are dependent from claim 1; claims 8 and 10 are dependent from claim 6. Applicants respectfully traverse the rejection.

In order to anticipate a claim, **a single reference must teach and enable each and every element of that claim.** See M.P.E.P. § 2131 at pg. 2100-67, 8th Ed., Rev. 6, Sept. 2007, citing *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

A. Elements of Claims 1 and 6

Claim 1 and dependent claims therefrom are directed, in part, to an algal cell which grows in **substantial absence of light**, the cell comprising chimeric DNA encoding a protein which will transport a catabolizable carbon source into the algal cell, wherein the algal cell without the chimeric DNA is a **phototrophic** cell. The specification defines "substantial absence of light" as "light conditions under which *phototrophic* cells would be unable to grow or would grow very poorly" and a "level of illumination which would be growth-limiting . . . for *phototrophic* cells." See Application as filed at pg. 14, lines 25-29 and pg. 15, lines 1-5 (emphases added). As such, an algal cell without the chimeric DNA that is a phototrophic cell will not grow or will only grow very poorly in light conditions under which the algal cell comprising the chimeric DNA will grow. Therefore, claim 1 and dependent claims therefrom are directed, in part, to (1) an algal cell comprising chimeric DNA encoding a transporter

protein for a catabolizable carbon source, (2) wherein the algal cell with the chimeric DNA grows in an amount of light under which a phototrophic cell would not grow or would only grow very poorly, and (3) wherein the algal cell lacking the chimeric DNA is a phototrophic cell.

Claim 6 and dependent claims therefrom are directed, in part, to an algal cell comprising chimeric DNA which encodes a protein that will transport a catabolizable carbon source into the algal cell, wherein the protein is expressed in an amount sufficient to transport into the cell adequate catabolizable carbon source to support **heterotrophic growth** of the cell. The specification defines "heterotrophic growth" as "*growth which does not require light* to occur and can, therefore, occur independent of the level or lack of illumination." See Application as filed at pg. 14, lines 9-11 (emphasis added). Therefore, claim 6 and dependent claims therefrom are directed, in part, to (1) an algal cell comprising chimeric DNA encoding a transporter protein for a catabolizable carbon source, (2) wherein expression of the transporter allows the algal cell to grow without light.

B. Lack of Teachings in Hallmann et al.

At best Hallmann *et al.* teaches transformation of *Volvox* cells with a Hup1 hexose transporter to transport radioactive sugars into the cells for metabolic labeling experiments. See Abstract. In terms of claim 1 and dependent claims therefrom, Hallmann *et al.* fails to teach *Volvox* cells comprising a chimeric DNA encoding a transporter of a catabolizable carbon source that are able to grow in an amount of light under which wild-type *Volvox* cells lacking the chimeric DNA do not grow or only grow

very poorly. In terms of claim 6 and dependent claims therefrom, Hallmann *et al.* fails to teach transformed *Volvox* cells that are capable of growing without light. Rather, Hallmann *et al.* states that: (1) **both** transformed *Volvox* cells and wild-type *Volvox* cells are grown under standard light conditions of 8 hours dark/16 hours light, and (2) **both** transformed *Volvox* cells and wild-type *Volvox* cells **fail to grow** on glucose during the dark over a culture period of 14 days without light. *See* Hallmann *et al.*, Abstract; pg. 669, "Culture Conditions," and pg. 671, first and second cols., bridging para.

C. Rejections Based on Hallmann *et al.*

The Examiner asserts that "an algal cell growing for 8-hr in the dark reads on the instant invention" and that "8h dark is substantially dark since the instant claims do not place any limitation in reference to any dark/light cycle." Office Action at pg. 4. However, the 8 hours of darkness referred to in Hallmann *et al.* is part of a standard *Volvox* growth cycle of 8 hours dark/16 hours light used to grow **both** transformed and wild-type cells. *See* Hallmann *et al.* pg. 669, "Culture Conditions," citing *Proc. Nat. Acad. Sci.* 71: 1050-1054 (1974), attached herewith as **EXHIBIT A**. Claim 1 requires that an algal cell comprising chimeric DNA encoding a transporter of a catabolizable carbon source must be capable of growing in light conditions under which the phototrophic cell lacking the chimeric DNA does not grow or grows very poorly. Hallmann *et al.* does not teach that the transformed *Volvox* cells described therein grow *during* the 8 hours of darkness. Hallmann *et al.* also fails to teach any light conditions under which transformed *Volvox* cells grow while wild-type *Volvox* cells do not grow or only grow poorly. As such, the mere discussion of 8 hours of darkness in a standard *Volvox* growth cycle does not anticipate claim 1. Similarly, discussion of the standard *Volvox* growth

cycle does not anticipate claim 6, which recites "heterotrophic growth," *i.e.*, growth without light.

The Examiner also asserts that Hallmann *et al.* discloses the *survival* of transformed *Volvox* after prolonged incubation in the dark and that such survival allegedly reads on "growth sustained for longer period in the dark because of the presence of the hexose transporter in the transformant algae in relation to absence of the same chimeric DNA." Furthermore, with regards to claim 6, the Examiner asserts that such survival reads "on a transformed algae able to grow heterotrophically." In contrast to the Examiner's assertions, Hallmann *et al.* specifically examined the ability of transformants to grow in glucose during 14 days in the dark and found that "**[b]oth transformants and parent strains did not grow during the 14-day dark phase**" *Id.* at pg. 671, first col., last para. Therefore, Hallmann *et al.* at best teaches that the transformed *Volvox* merely *survive* the absence of light for 14 days and *only* grow when standard light conditions shared with wild-type *Volvox* are reintroduced. As such, the mere *survival* of the transformants during the 14 days of darkness does not anticipate claim 1, which recites *growth* in the substantial absence of light. Since the transformants in Hallmann *et al.* required the normal *Volvox* light cycle in order to grow, Hallmann *et al.* also does not anticipate claim 6, which recites heterotrophic growth (growth that does not require light).

The Examiner also states that "as the Hallmann *et al.* publication teaches *Volvox* algae expressing the [] heterologous HUP1 transporter, then any activity [] resulting from the expression of the HUP1 proteins **such as supporting heterotrophic growth** of the cell is [] **inherently anticipated** because the structure of the algal cell is the same."

Office Action at pg. 5, emphasis added. However, a finding of "[i]nherent anticipation requires that the missing descriptive material is '*necessarily present*,' *not merely probably or possibly present*, in the prior art." *Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1295, 63 USPQ2d 1597, 1599 (Fed. Cir. 2002)(emphasis added); *see also, In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999); *Schering Corp. v. Geneva Pharm., Inc.* 339 F.3d 1373, 1377 (Fed. Cir. 2003). Nothing in the teachings of Hallmann *et al.* supports a finding that the claims would *necessarily* result from practice of Hallmann *et al.* In fact, Hallmann *et al.* *expressly* teaches transformed cells incapable of heterotrophic growth by teaching that transformed *Volvox* cells do not grow during 14 days of darkness and require light to grow. As such, the claims are not inherently anticipated by Hallmann *et al.*

Because Hallmann *et al.* fails to teach, either expressly or inherently, an algal cell that "grows in substantial absence of light" or that is capable of "heterotrophic growth," Hallmann *et al.* does not anticipate the claims.

Based on the foregoing, the Examiner is respectfully requested to reconsider and withdraw the novelty rejection over Hallmann *et al.*

IV. Rejection under 35 U.S.C. § 103(a)

A. Requirements for Establishing Obviousness

Based on the Supreme Court decision in *KSR International Co. v. Teleflex Inc.*, 127 S. Ct. 1727 (2007) ("*KSR*"), and current USPTO Examination Guidelines, the proper objective analysis for determining obviousness under 35 U.S.C. § 103 is as stated in *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17 (1966). *See also*, Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of

the Supreme Court Decision in *KSR International Co. v. Teleflex Inc.*, 72 Fed. Reg. 57526 (Oct. 10, 2007) ("Examination Guidelines"). Under this analysis, obviousness is a question of law based on underlying factual inquiries. The factual inquiries enunciated by the Court include: (1) determining the scope and content of the prior art; (2) ascertaining the differences between the claimed invention and the prior art; (3) resolving the level of ordinary skill in the pertinent art; and (4) considering objective evidence present in the application indicating nonobviousness. One example of objective evidence of non-obviousness includes unexpected results. See M.P.E.P. § 716.02(a) at pg. 700-292, 8th Ed., Rev. 6, Sept. 2007.

In ascertaining the differences between the claimed invention and the prior art, it is well-established that a prior art reference must be considered in its entirety, including portions that would **teach away** from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 220 USPQ 303 (Fed. Cir. 1983). See also, M.P.E.P. § 2141.02(VI) at pg. 2100-126, 8th Ed., Rev. 6, Sept. 2007. See also, Examination Guidelines at 57528, first col., part B, and at 57529, third col. As noted by the Examination Guidelines: "In short, the focus when making a determination of obviousness should be on *what a person of ordinary skill in the pertinent art would have known at the time of the invention*, and on what such a person would have *reasonably* expected to have been able to do in view of that knowledge." *Id.* at 57527, third col., first full para. (emphasis added).

B. Rejection of Claims 1 and 6

Claims 1 and 6 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Hallmann *et al.*

The teachings of Hallmann *et al.* have been discussed above. In brief, Hallmann *et al.* discusses transformation of *Volvox* cells with a Hup1 hexose transporter to transport radioactive sugars into the cells for metabolic labeling experiments. Hallmann *et al.* does not teach or suggest the conditions of claim 1 in which algal cells comprising chimeric DNA grow in an amount of light under which the phototrophic cell lacking the chimeric DNA would not grow or would only grow very poorly. Rather, Hallmann *et al.* discusses use of the same light conditions to grow both *Volvox* cells transformed with Hup1 and wild-type cells lacking Hup1. *Id.* at pg. 669, "Culture Conditions," and pg. 671, first and second cols., bridging para. Hallmann *et al.* also does not teach or suggest the conditions of claim 6 in which algal cells comprising chimeric DNA are capable of growing without light. Rather, Hallmann *et al.* teaches that transformed cells are unable to grow heterotrophically in the dark. *Id.* at pg. 671, first and second cols., bridging para., stating that "[b]oth transformants and parent strains did not grow during the 14-day dark phase"

In fact, since Hallmann *et al.* teaches that *Volvox* cells transformed with Hup1 are not capable of growth in the absence of light, Hallmann *et al.* teaches away from the claims. One of ordinary skill in the art would not have reasonably been led to transform a phototrophic algal cell with a transporter of a catabolizable carbon source in order to achieve growth of the cell in the substantial absence of light as require by claim 1 or

growth without light as required by claim 6 given Hallman *et al.*'s teaching that *Volvox* transformed with Hup1 require light to grow.

Additionally, claims 1 and 6 would have been unexpected over Hallmann *et al.* at the application priority date as shown by references published after the priority date. Zaslavskaja *et al.*, *Science* 292: 2073-2075 (June 2001), attached herewith as **EXHIBIT B**, is an article that largely corresponds to the work disclosed in the present application and that was featured on the cover issue of *Science* in which it was published. A publication discussing Zaslavskaja *et al.* states that "[i]t, therefore, comes as a rather *unexpected* and very interesting result that Zaslavskaja and colleagues (2001) were able to generate by genetic engineering a facultatively heterotrophic diatom that *grows in the dark* . . . *Remarkably*, creation of this "superior diatom" was achieved by introducing into *Phaeodactylum tricornutum* only a single gene (*glut-1*) that encodes the glucose transporter protein (*glut-1*) from human erythrocytes." See, Kröger, N., *J. Phycol.* 37: 657-658 (Oct. 2001), emphasis added, attached herewith as **EXHIBIT C**.

In summary, claims 1 and 6 are non-obvious over Hallmann *et al.* for at least the following reasons: (1) Hallmann *et al.* does not provide any teaching or guidance regarding an algal cell comprising a chimeric DNA encoding a transporter for a catabolizable carbon source that is capable of growing in the substantial absence of light or that is capable of growing with light; (2) Hallmann *et al.* teaches away from growth of algal cells comprising a chimeric DNA encoding a transporter for a catabolizable carbon source in the substantial absence of light or without light by teaching that *Volvox* cells transformed with Hup1 do not grow without light; and (3) the characteristics of the algal

cells of claims 1 and 6 were recognized as surprising and unexpected after the priority date of the application.

Based on the foregoing, the Examiner is respectfully requested to reconsider and withdraw the obviousness rejection of claims 1 and 6.

C. *Rejection of Claims 2 and 7*

Claims 2 and 7 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Hallmann *et al.* in view of Dunahay *et al.*, *J. Phycol.* 31: 1004-1012 (1995) ("Dunahay *et al.*"), in further view of Fisher *et al.*, *J. Phycol.* 35: 113-120 (1999) ("Fisher *et al.*"). Applicants respectfully traverse the rejection.

Claims 2 and 7 are dependent from claims 1 and 6, respectively, and recite that the cell is a microalgal cell. Claims 2 and 7 are non-obvious over Hallmann *et al.* for the reasons discussed above with regards to non-obviousness of claims 1 and 6.

Dunahay *et al.* and Fisher *et al.* do not overcome the deficiencies of Hallmann *et al.* Specifically, Dunahay *et al.* and Fisher *et al.* fail to teach or provide any guidance regarding a microalgal cell comprising a chimeric DNA encoding a transporter for a catabolizable carbon source that is capable of growing in the substantial absence of light or that is capable of growing without light.

Dunahay *et al.* does not disclose transformation of a microalgal cell with a transporter of a catabolizable carbon source.

Fischer *et al.* discusses a microalgal cell transformed with Hup1 but teaches that that "**transformants were not able to grow on glucose in the dark.**" See Fischer *et al.* at pg. 118, last sentence of first para., emphasis added. As such, Fischer *et al.* teaches away from the claims for the same reasons described above with regards to Hallmann *et al.* Rather than supporting alleged obviousness of claims 2 and 7, Fischer *et al.* provides additional evidence that references at the priority date taught away from all of the claims and that the claims were unexpected.

Claims 2 and 7 are non-obvious over Hallmann *et al.* in view of Dunahay *et al.*, in further view of Fisher *et al.* for at least the following reasons: (1) Dunahay *et al.* and Fisher *et al.* do not provide any teaching or guidance regarding a microalgal cell comprising a chimeric DNA encoding a transporter for a catabolizable carbon source that is capable of growing in the substantial absence of light or that is capable of growing without light; and (2) Fisher *et al.* further teaches away from the claims by disclosing microalgal cells transformed with Hup1 that do not grow in the dark.

Based on the foregoing, the Examiner is respectfully requested to reconsider and withdraw the obviousness rejection of claims 2 and 7.

D. Rejection of Claims 4 and 9

Claims 4 and 9 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Hallmann *et al.* in view of Dunahay *et al.*, in further view of Fisher *et al.*, and in further view of Lemoine *et al.*, *FEBS Letters* 454: 325-330 (1999) ("Lemoine *et al.*"). Applicants respectfully traverse the Examiner's rejection.

Claims 4 and 9 are dependent from claims 1 and 6, respectively, and recite that the protein which will transport a catabolizable carbon source is a "disaccharide transporter." Claims 4 and 9 are non-obvious over Hallmann *et al.* in view of Dunahay *et al.*, in further view of Fisher *et al.* for the same reasons as discussed regarding non-obviousness of claims 1 and 6 and non-obviousness of claims 2 and 7.

Lemoine *et al.* does not overcome the deficiencies of Hallmann *et al.* in view of Dunahay *et al.*, in further view of Fisher *et al.*

Lemoine *et al.* at best discloses isolation of a sucrose transporter-like protein from a tobacco pollen cDNA library. *See* Abstract. Lemoine *et al.* fails to teach or provide any guidance regarding an algal cell comprising a chimeric DNA encoding a disaccharide transporter for a catabolizable carbon source that is capable of growing in the substantial absence of light or that is capable of growing without light. As such, claims 4 and 9 are non-obvious over Hallmann *et al.* in view of Dunahay *et al.*, in further view of Fisher *et al.*, and in further view of Lemoine *et al.*

Based on the foregoing, the Examiner is respectfully requested to reconsider and withdraw the obviousness rejection of claims 4 and 9.

Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

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